

10806087

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 747 597 A3

(12)

## EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
20.01.1999 Bulletin 1999/03

(51) Int. Cl.<sup>6</sup>: F04C 29/10, F04C 18/02

(43) Date of publication A2:  
11.12.1996 Bulletin 1996/50

(21) Application number: 95307811.0

(22) Date of filing: 01.11.1995

(84) Designated Contracting States:  
DE ES FR IT

(30) Priority: 07.06.1995 US 486118

(71) Applicant: COPELAND CORPORATION  
Sidney Ohio 45365-0669 (US)

(72) Inventors:

- Bass, Mark  
Sidney, Ohio 45365 (US)
- Doepker, Roy J.  
Lima, Ohio 45806 (US)

- Caillat, Jean-Luc M.  
Dayton, Ohio 45414 (US)
- Warner, Wayne R.  
Piqua, Ohio 45356 (US)

(74) Representative:  
Price, Nigel John King  
J.A. KEMP & CO.  
14 South Square  
Gray's Inn  
London WC1R 5LX (GB)

## (54) Capacity modulated scroll machine

(57) A scroll-type machine is disclosed which is particularly well suited for use as a compressor in refrigeration and air conditioning systems and incorporates a unique arrangement for modulating the capacity thereof. In one group of embodiments the capacity of the scroll-type machine is modulated by relative axial movement between the scroll members so as to form a leakage path across the wrap tips and opposed end plates. In another group of embodiments, modulation is achieved by reducing the orbital radius of one of the scroll members to thereby form a leakage path across the flank surfaces of the wraps. Both types of scroll separation may be accomplished in a time pulsed manner to thereby enable a full range of modulation with the duration of the loading and unloading periods being selected to maximize the efficiency of the overall system. A motor control arrangement is also disclosed which may be used with either of the modulation methods mentioned above to increase the efficiency of the motor during periods of reduced load. Additionally, either of the modulation arrangements mentioned above may be combined with a delayed suction form of capacity modulation with or without the motor control feature to thereby achieve better operating efficiency under certain conditions.

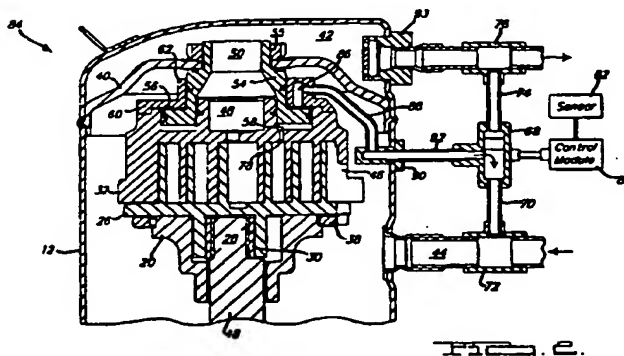


FIG. 2.

0 747 597 A3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 95 30 7811

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 86 01262 A (SUNDSTRAND CORPORATION) 27 February 1986	1,7-9, 11, 13-15,18	F04C29/10 F04C18/02
Y	* page 2, last paragraph - page 3, line 32 * * page 5, line 8 - page 11, line 13; figures 1,2 * ---	2-5,20, 21,23, 32-36	
X	US 5 342 186 A (SWAIN) 30 August 1994	1,7,8, 10,13-16 2-5,20, 21,23, 32,35,36	
Y	* column 2, line 5 - line 53 * * column 4, line 42 - column 5, line 35; figure 1 * * column 6, line 33 - column 7, line 58; figures 2-4 * ---		TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Y	DE 34 22 398 A (KNORR-BREMSE) 19 December 1985  * page 6, line 10 - line 30 * * page 7, line 16 - page 8, line 2 * * page 9, line 34 - page 13, line 23; figure 1 * * page 15, line 19 - page 20, line 24; figure 2 * --- -/--	2-4,20, 21,23, 32-34,36	F04C F01C
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>1 December 1998</b>	Examiner <b>Kapoulas, T</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 95 30 7811

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	US 4 604 036 A (MASATSUNE SUTOU) 5 August 1986 * column 1, line 15 - line 34 * * column 1, line 54 - column 2, line 3; figure 1 * * column 3, line 6 - column 4, line 36; figures 4,5 *	4,5,32, 35,36	
X	EP 0 351 690 A (AGINFOR) 24 January 1990 * column 3, line 14 - line 46 * * column 4, line 16 - column 6, line 28; figures *	1,7,8, 11,13-16	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 1 December 1998	Examiner Kapoulas, T
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**THIS PAGE BLANK (USPTO)**